Seminar Agenda

- Welcome and Introduction
- Operations Modeling Basics
- Operations Model Applications
- Q&A (Panel Discussion)
- Lunch
- Operations Modeling Tools
  - CALSIM II – Erik Reyes
  - HYDROPS – Tung Van Do
  - WQRSS – Carl Chen
  - HEC-RAS – Eric Clyde
- Next Steps

Temperature Model of Oroville Facilities and Feather River

Carl Chen, Wangteng Tsai and Curtis Loeb
Systech Engineering, Inc.
June 24, 2003

Model Description

- Engine WQRRS
- Model Components
  - Lake Oroville Model
  - Thermalito-Complex Model
  - Feather River Model
  - Integration
- User Interface
  - Map screen
  - Input screen
  - Output screen

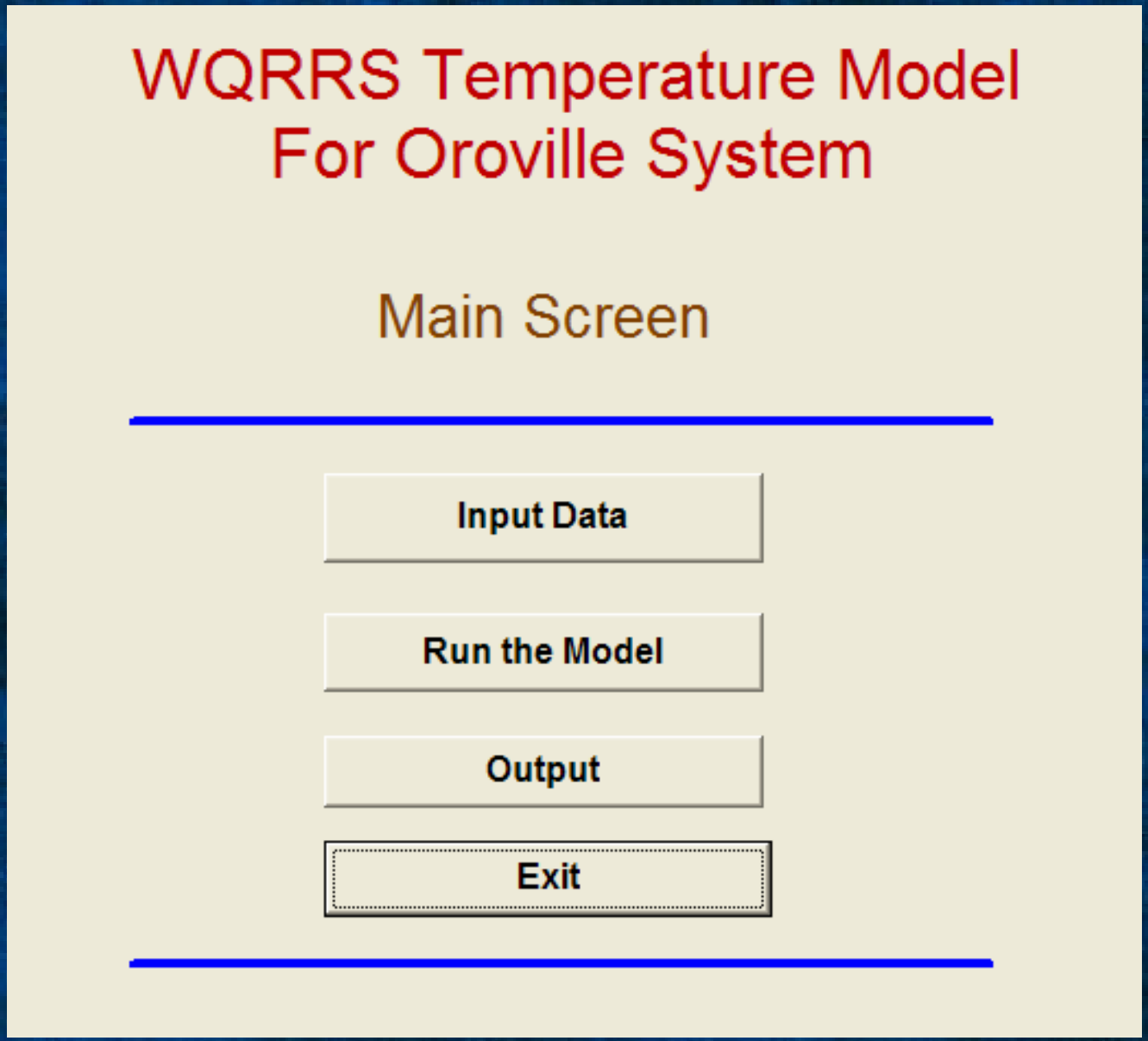
Model Theory

- Control Volume
  - Lake layers
  - River segments
- Water Balance
  - Tributary inflows
  - Diversions
  - Release & pumped back
- Heat Budget
  - Solar radiation
  - Evaporation
  - Advection, diffusion, mixing

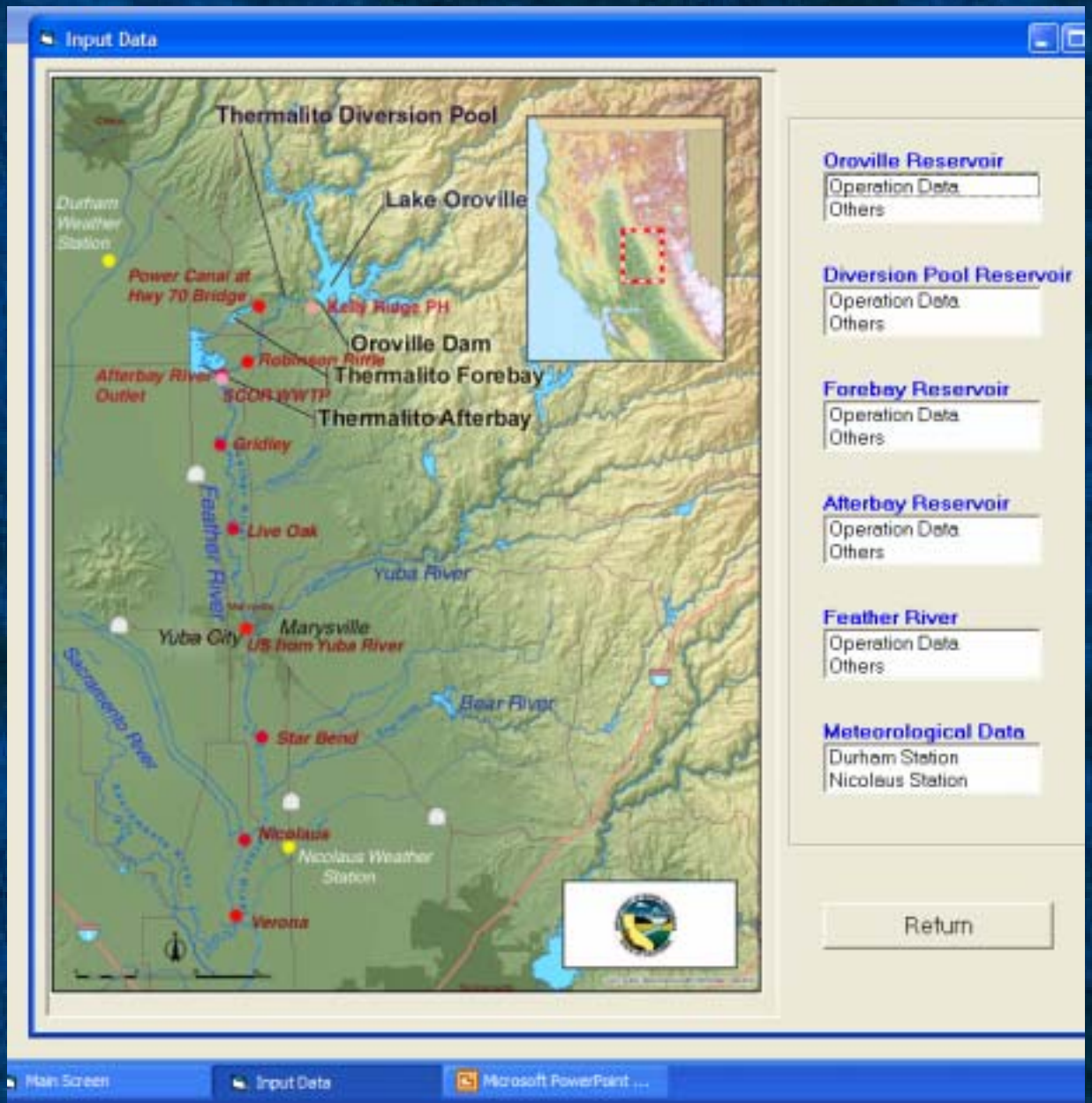
Modeling Steps

- Calibration -2002
  - Actual flow
  - Actual meteorology
  - Simulated vs. Observed data
- Benchmark – Long-Term
  - Synthesized hydrology
  - Synthesized meteorology
- What-If Scenarios
  - Benchmark case
  - Plus proposed changes

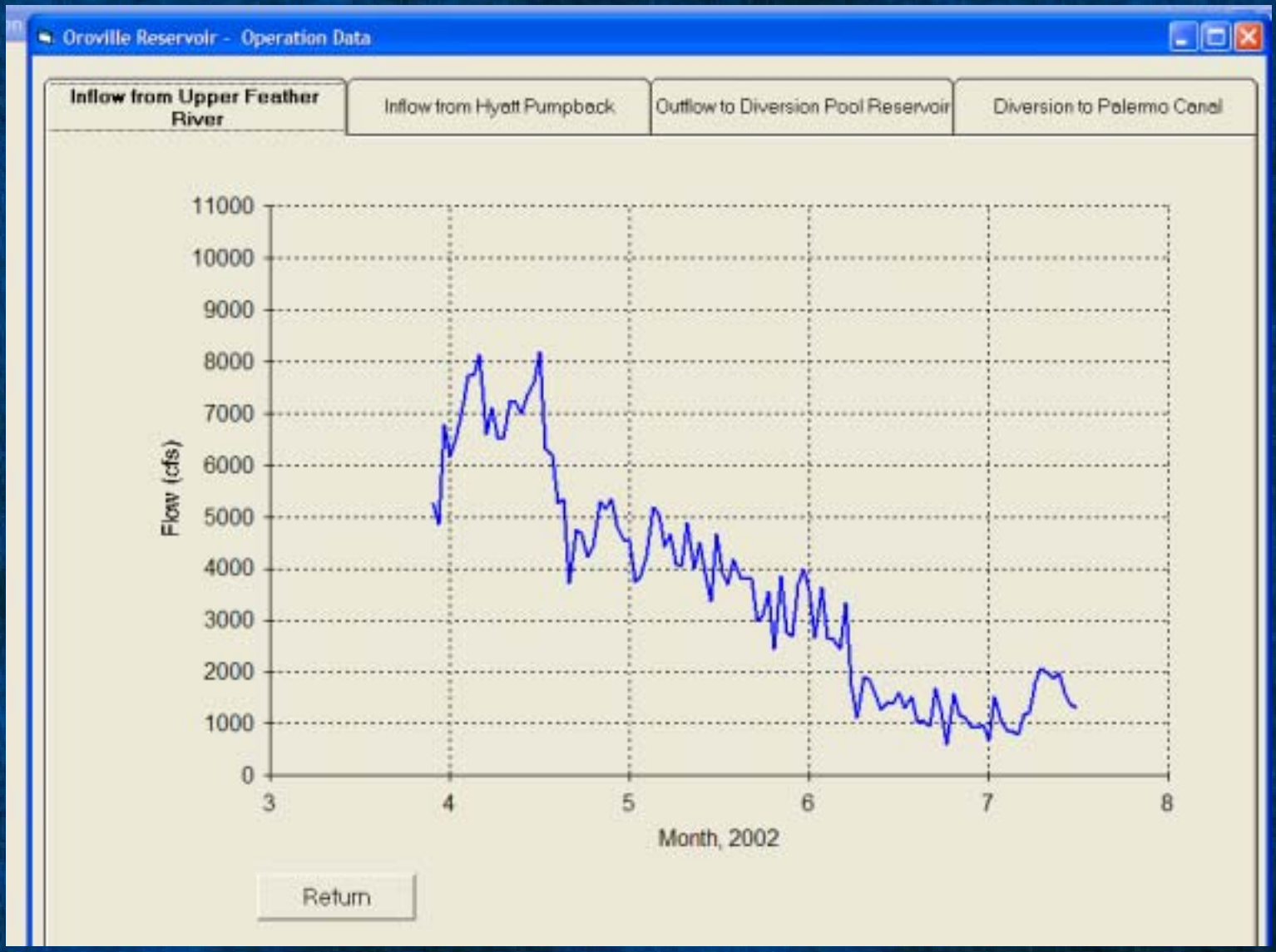
Graphical User Interface



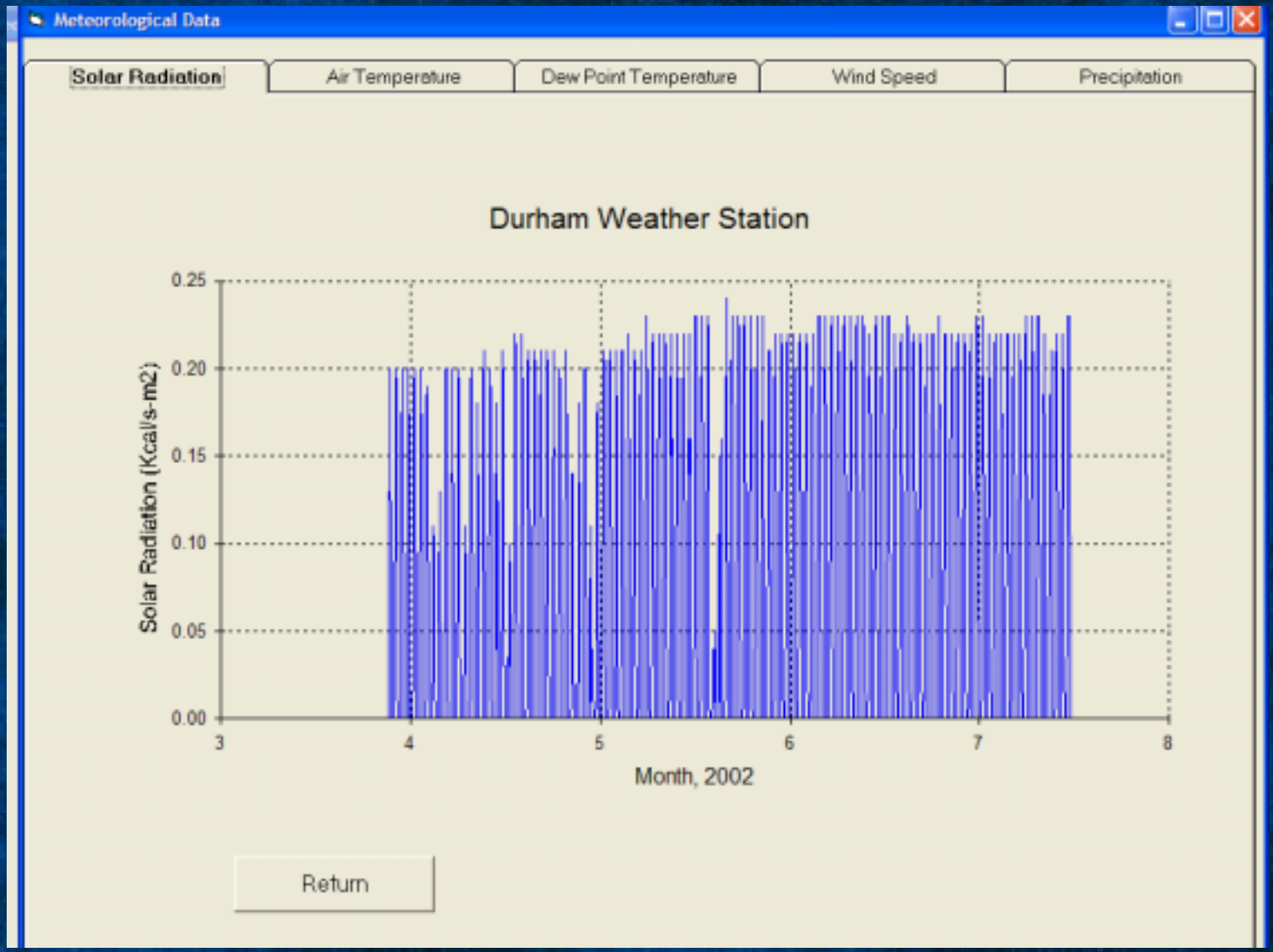
Input Data


Input Data
Thermalito Diversion Pool
Lake Oroville
Durham Weather Station
Power Canal at Hwy 70 Bridge
Kelly Ridge PH
Oroville Dam
Robinson Riffle
Afterbay River Outlet
SCORWTP
Thermalito Forebay
Thermalito Afterbay
Gridley
Feather River
Live Oak
Yuba River
Marysville
Yuba City
US from Yuba River
Bear River
Star Bend
Sacramento River
Nicolaus
Nicolaus Weather Station
Verona
Oroville Reservoir
Operation Data
Others
Diversion Pool Reservoir
Operation Data
Others
Forebay Reservoir
Operation Data
Others
Afterbay Reservoir
Operation Data
Others
Feather River
Operation Data
Others
Meteorological Data
Durham Station
Nicolaus Station
Return
Main Screen
Input Data
Microsoft PowerPoint ...

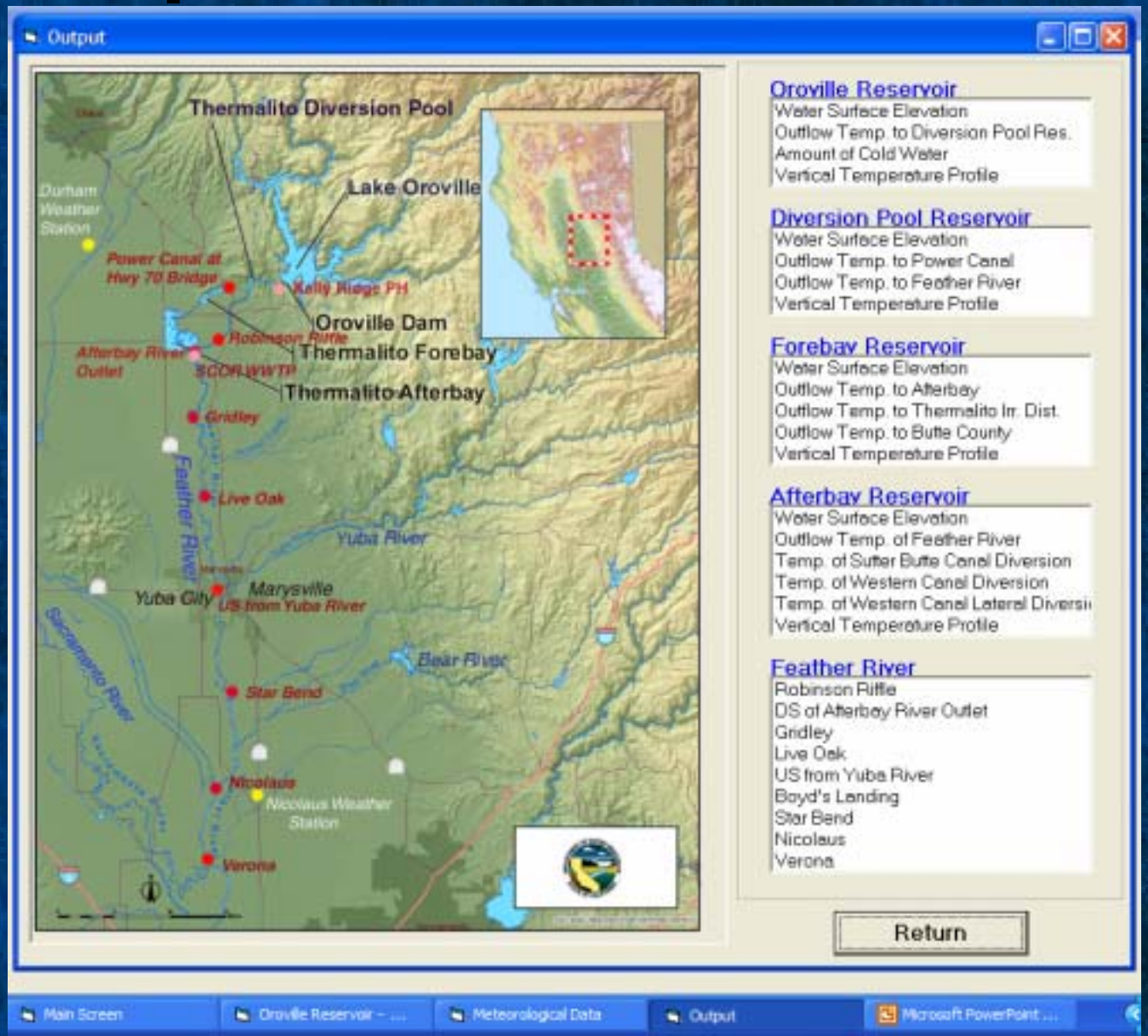
Oroville Operational Data



Meteorology Data



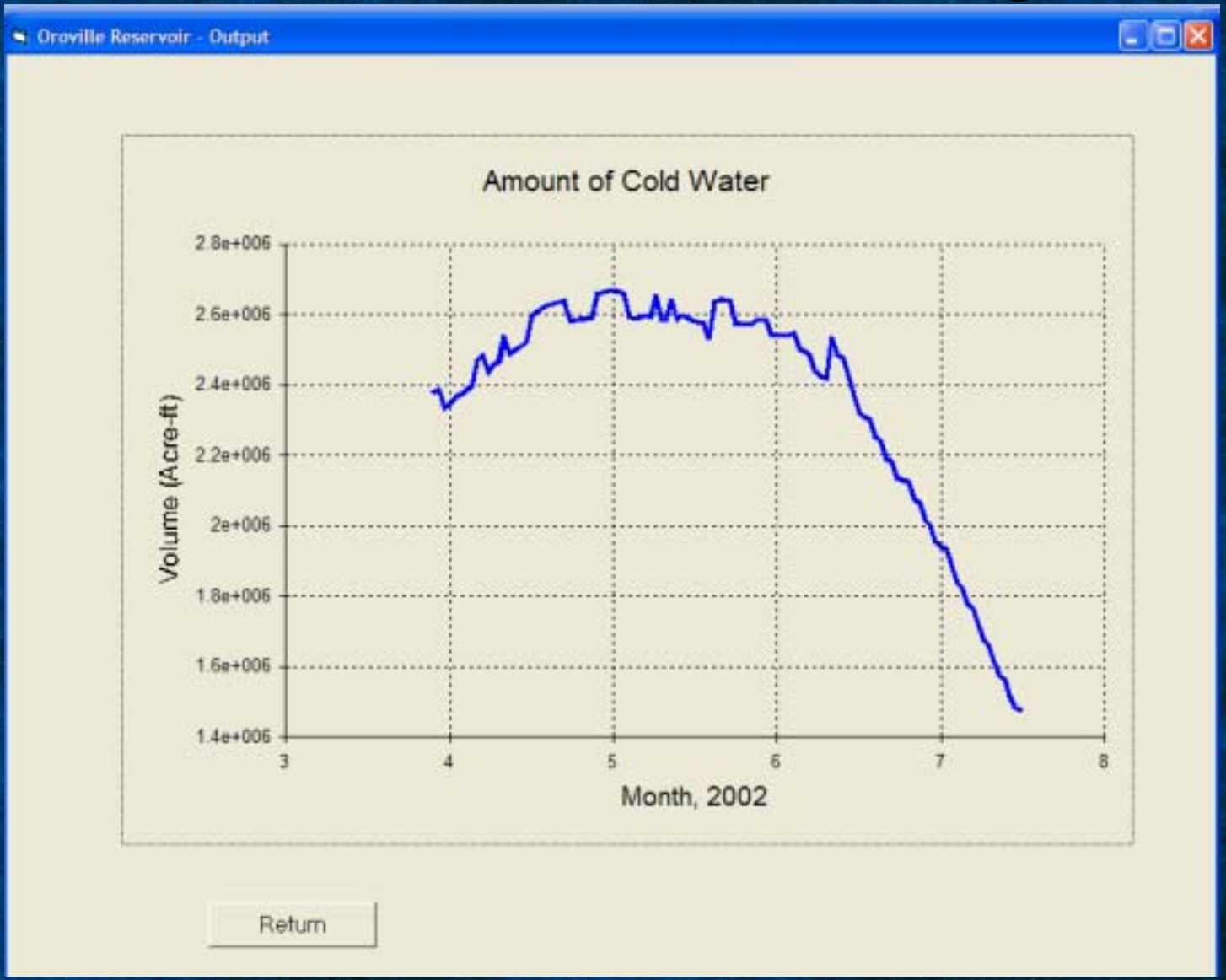
Output Data


Output
Thermalito Diversion Pool
Lake Oroville
Durham Weather Station
Power Canal at Hwy 70 Bridge
Kelly Ridge PH
Oroville Dam
Robinson Riffle
Thermalito Forebay
Afterbay River Outlet
SCOR-WWTP
Thermalito Afterbay
Gridley
Feather River
Live Oak
Yuba River
Yuba City
Marysville
US from Yuba River
Sacramento River
Bear River
Star Bend
Nicolaus
Nicolaus Weather Station
Verona
Oroville Reservoir
Water Surface Elevation
Outflow Temp. to Diversion Pool Res.
Amount of Cold Water
Vertical Temperature Profile
Diversion Pool Reservoir
Water Surface Elevation
Outflow Temp. to Power Canal
Outflow Temp. to Feather River
Vertical Temperature Profile
Forebay Reservoir
Water Surface Elevation
Outflow Temp. to Afterbay
Outflow Temp. to Thermalito Irr. Dist.
Outflow Temp. to Butte County
Vertical Temperature Profile
Afterbay Reservoir
Water Surface Elevation
Outflow Temp. of Feather River
Temp. of Sutter Butte Canal Diversion
Temp. of Western Canal Diversion
Temp. of Western Canal Lateral Diversi
Vertical Temperature Profile
Feather River
Robinson Riffle
DS of Afterbay River Outlet
Gridley
Live Oak
US from Yuba River
Boyd's Landing
Star Bend
Nicolaus
Verona
Return
Main Screen
Oroville Reservoir - ...
Meteorological Data
Output
Microsoft PowerPoint ...

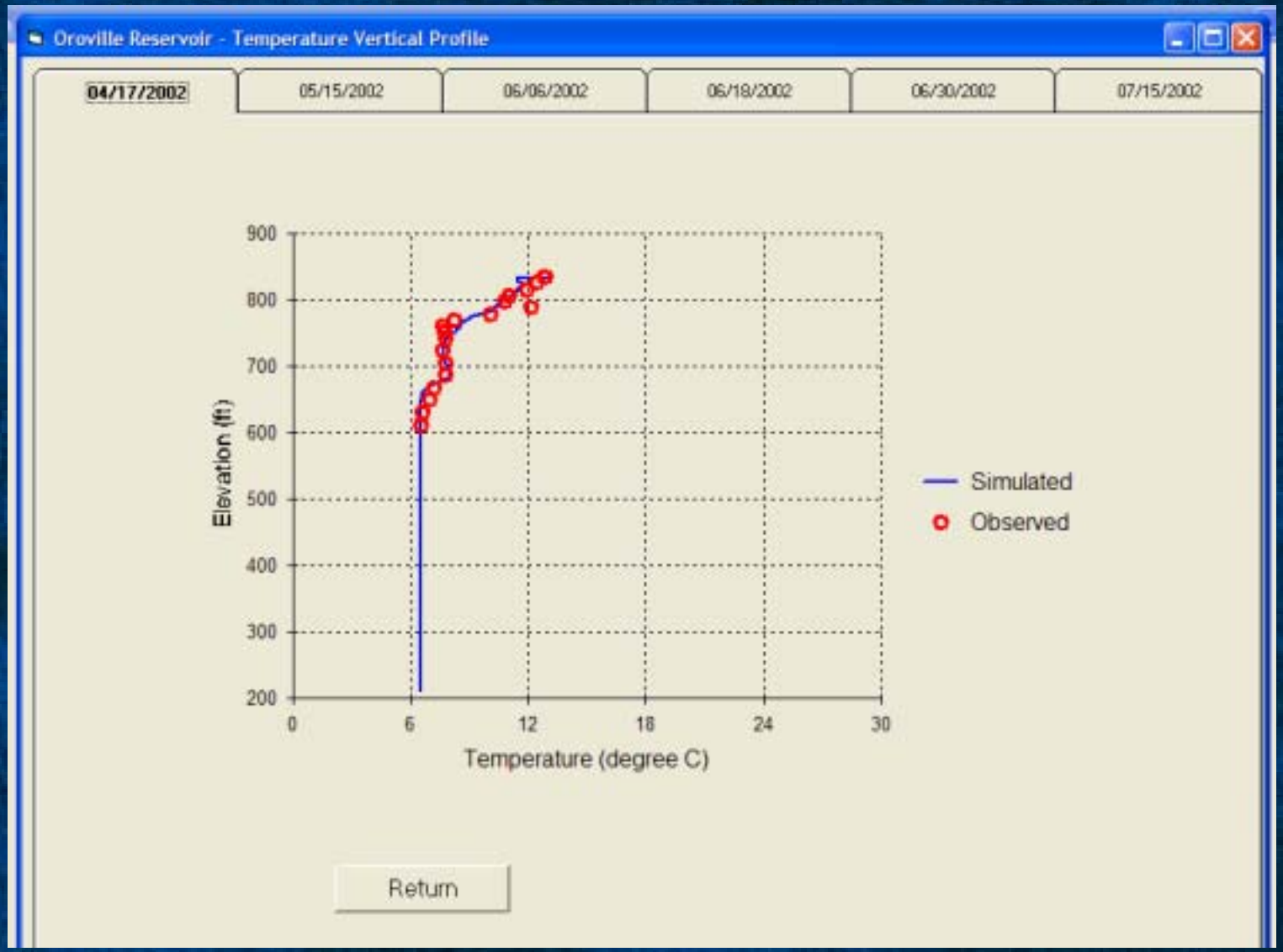
Model Output (Hourly)

- Lake
  - Temperature profile
  - Cold water storage volume
  - Temperature of reservoir release
- River
  - Temperature
  - Flow
  - Water depth
- Diversions
  - Temperature

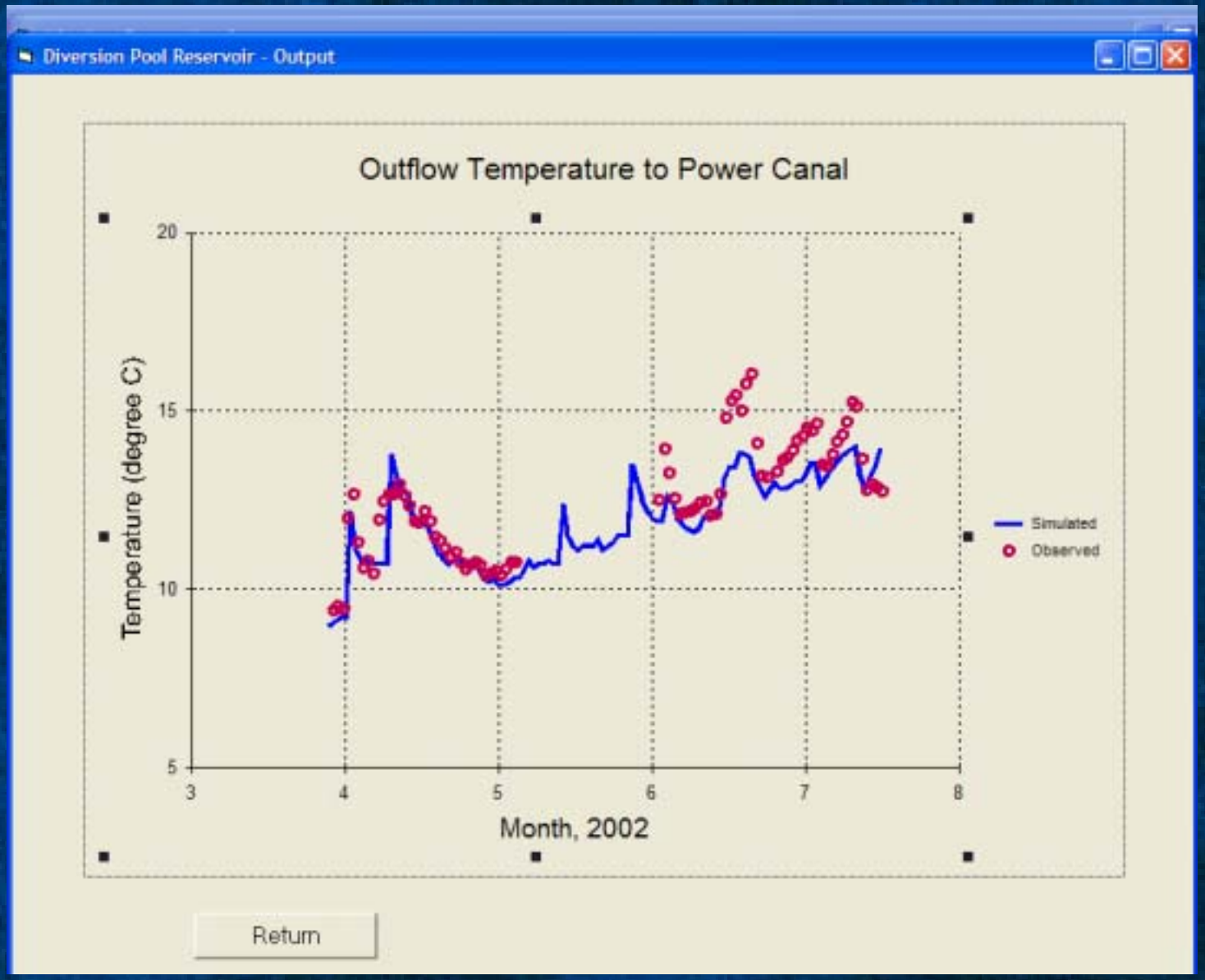
Oroville Cold Water Storage



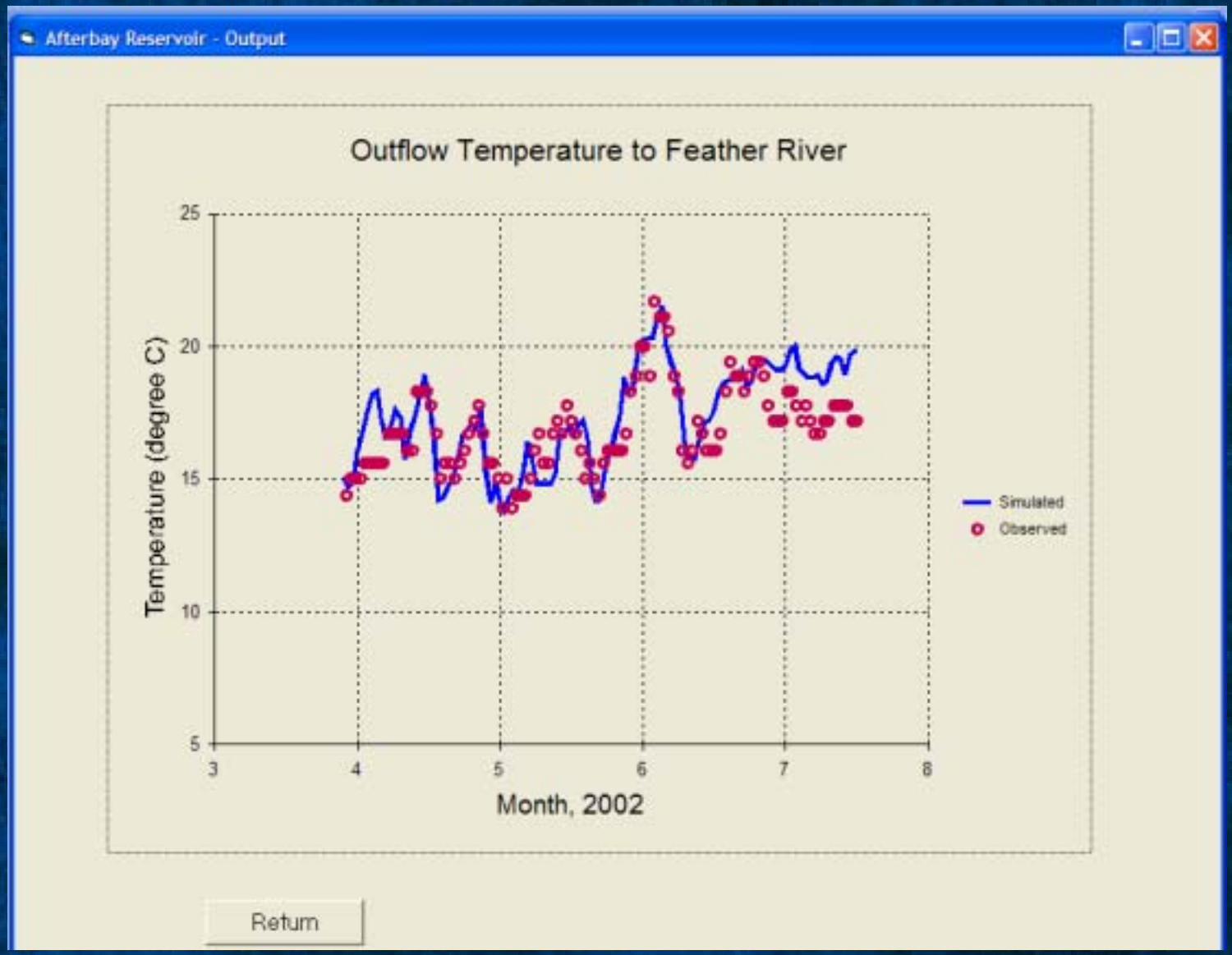
Oroville Temperature Profile



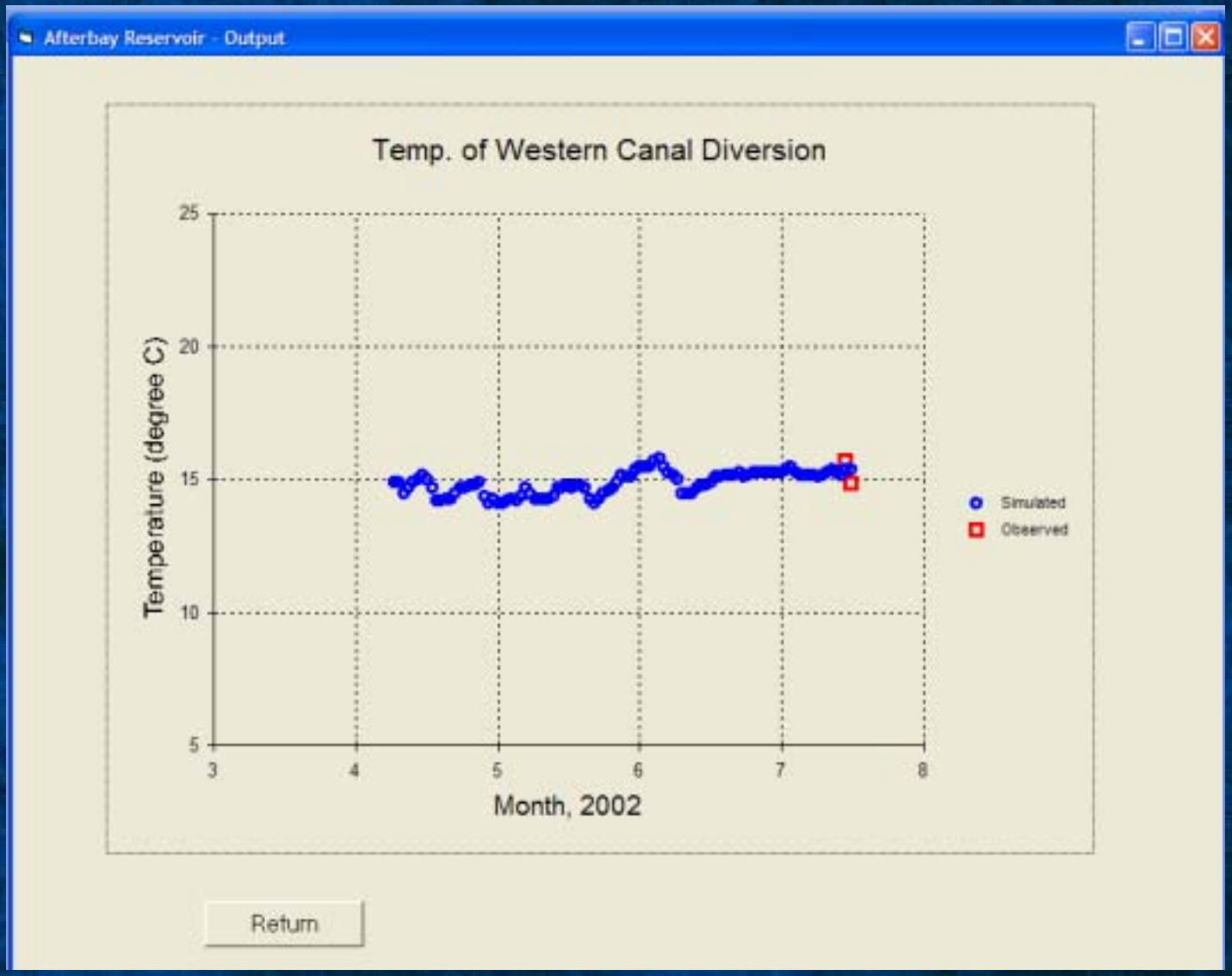
Power Canal Temperature



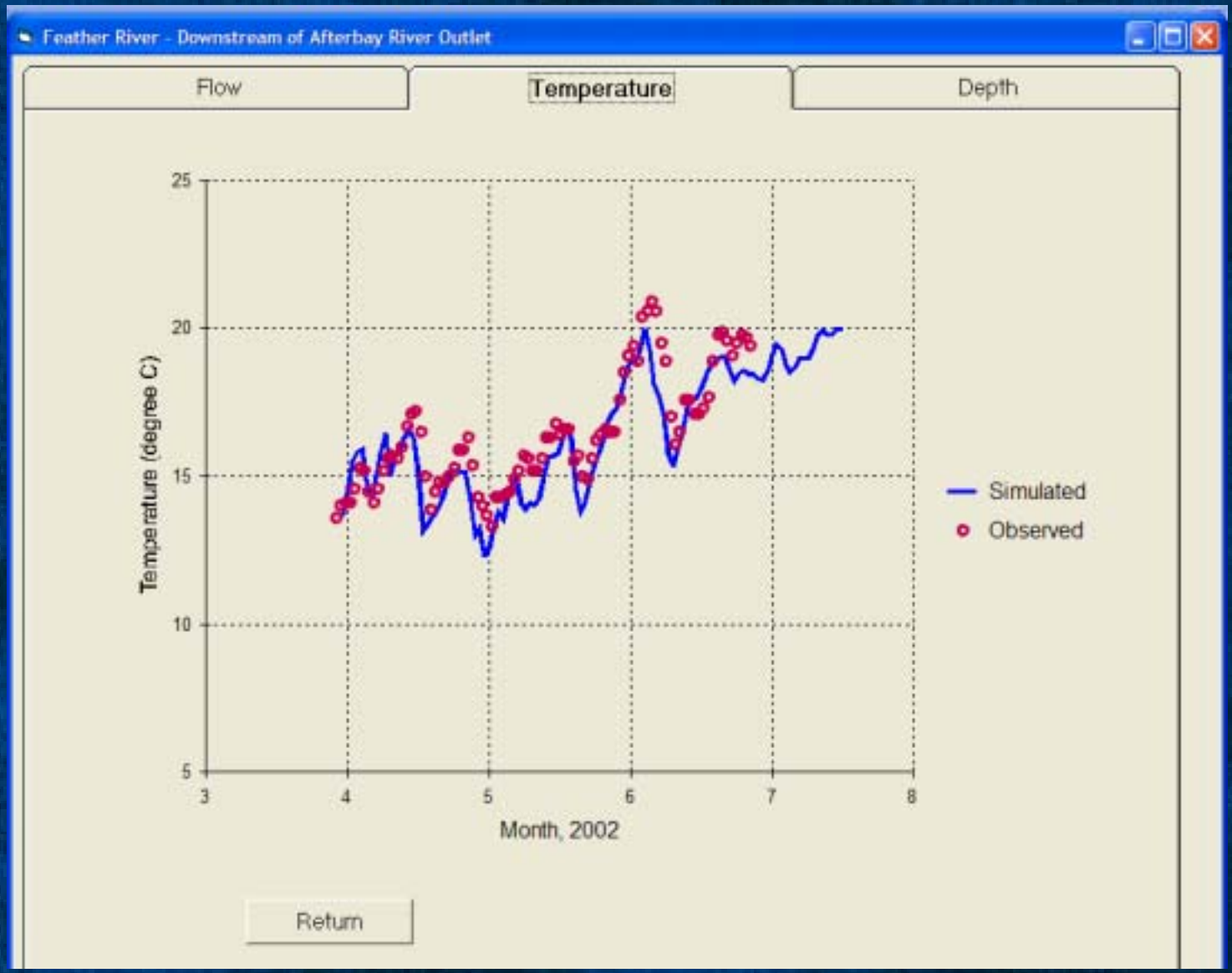
Thermalito Outflow Temperature



Diversion Temperature

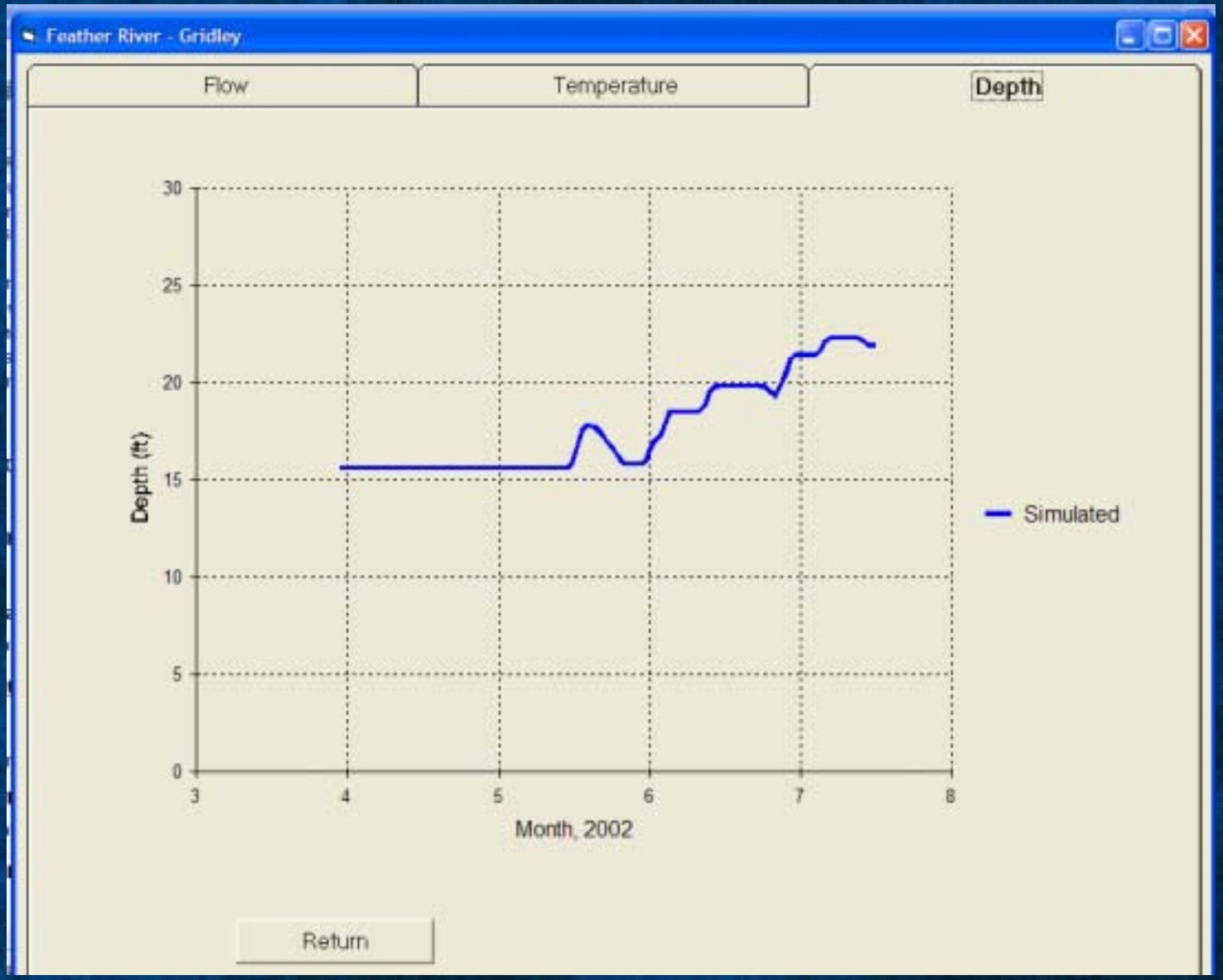


Feather River Temperature

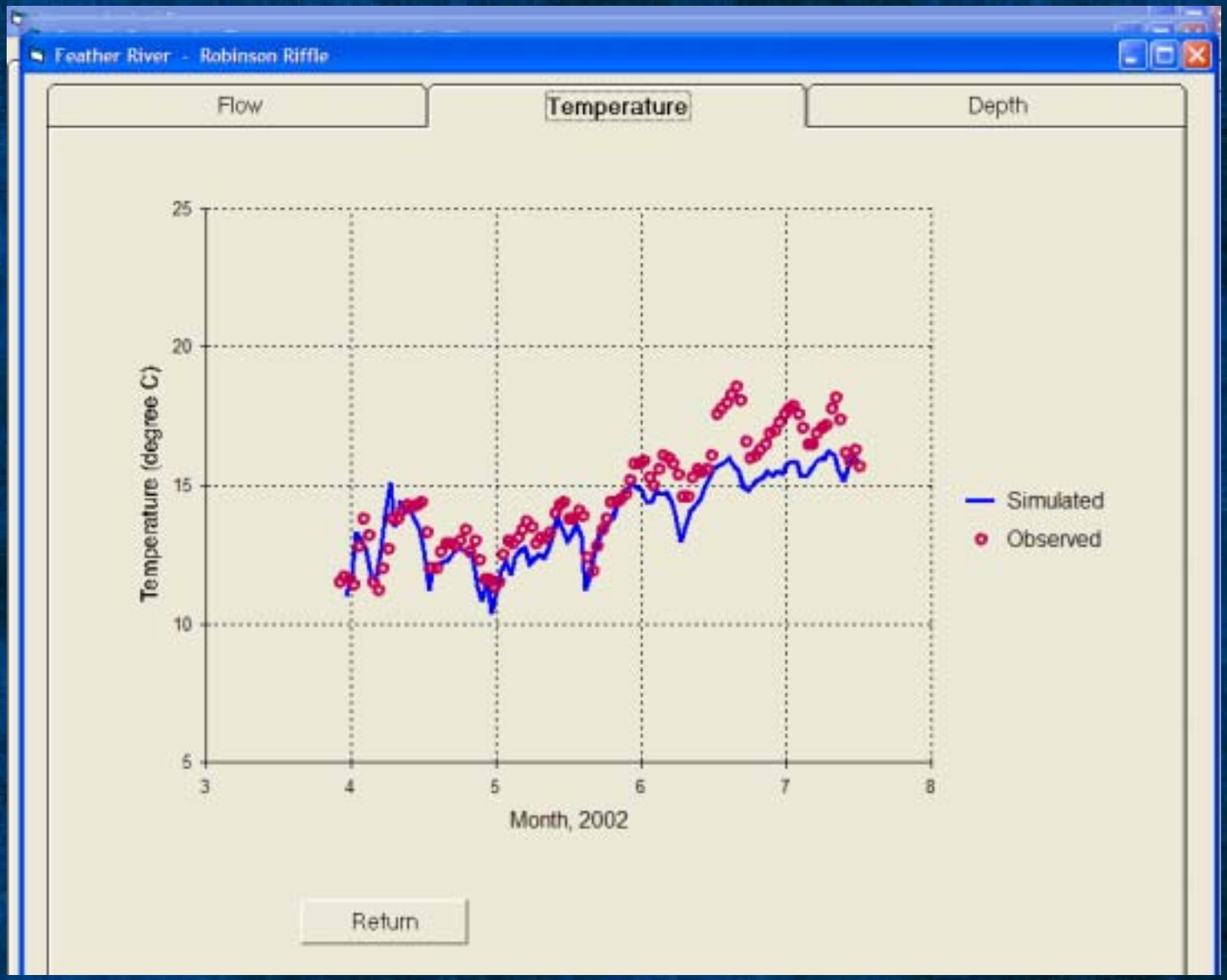


Feather River Flow

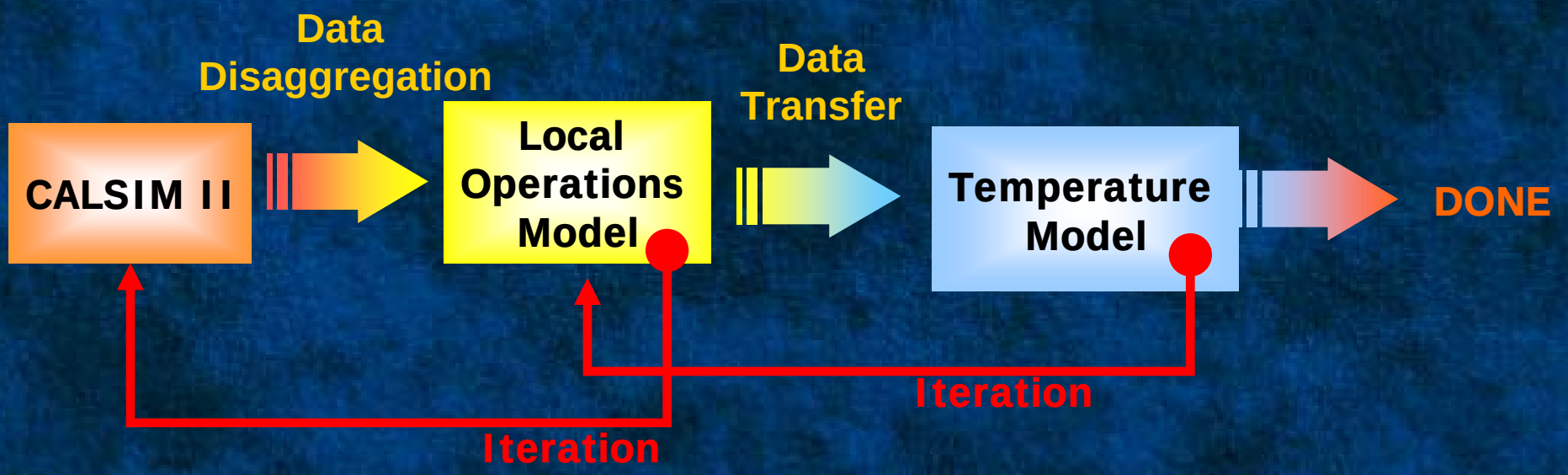
Feather River Water Depth



Feather River Temperature



Model Application



- Water supply conditions
- Monthly operations and water budget

- Power generation
- Hourly operation

- Reservoir temperature
- River temperature
- Diversion temperature

WQRSS Q&A

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